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NATIONAL DAM SAFETY PROGRAM. CAGE DAM (INVENTORY NUMBER VA 0833--ETC(U)
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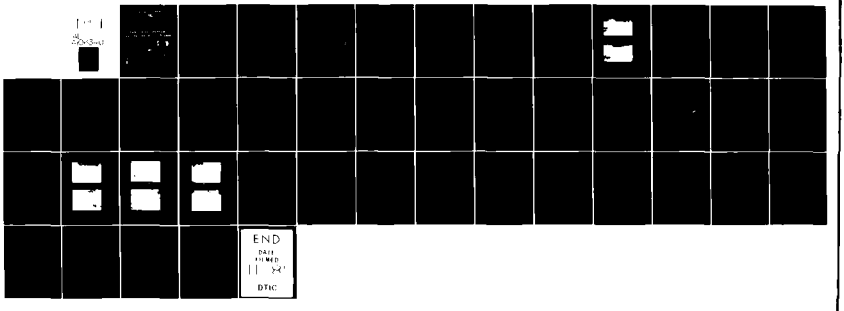

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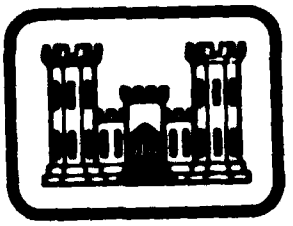
STAUNTON RIVER BASIN

AD A106340 LEVEL II

Name Of Dam: CAGE
Location: HALIFAX COUNTY
Inventory Number: VA 00336

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



PREPARED BY
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

IN CONJUNCTION WITH

COMMONWEALTH OF VIRGINIA
STATE WATER CONTROL BOARD
MAY 1981

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

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20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspection. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

ROANOKE RIVER BASIN

NAME OF DAM: CAGE DAM
LOCATION: HALIFAX COUNTY, VIRGINIA
INVENTORY NUMBER: VA 08335

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM.

Cage Dam (Inventory Number VA 08335)
Staunton River Basin. Halifax County,
Virginia. Phase I Inspection Report.

9/ Final rept.,

10/ Boris G. /Taran

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11/ MAY 1981

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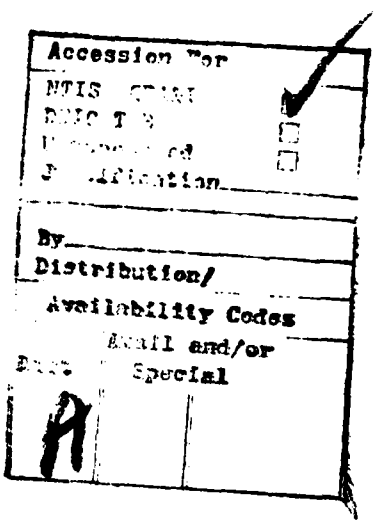


PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

BRIEF ASSESSMENT OF DAM

Name of Dam:	Cage Dam
State:	Virginia
Location:	Halifax County
USGS Quad Sheet:	South Boston, Virginia
Stream:	Rocky Branch of the Dan River
Date of Inspection:	1 May 1981

Cage Dam is an earthfill structure about 400 feet long and 26.3 feet high with a 13-foot crest. The dam is owned and maintained by Mr. Robert F. Cage. The dam is classified as a small size dam with a significant hazard classification. The principal spillway is estimated to be a 42-inch diameter corrugated metal pipe drop-inlet riser that connents to a 30-inch corrugated metal pipe which passes through the dam at low level. The emergency spillway is an open channel cut into the right abutment. The reservoir is used for recreation by the owner.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is the 1/2 PMF (Probable Maximum Flood). The spillway will pass 12 percent of the PMF or 24 percent of the SDF without overtopping the crest of the dam. The SDF will overtop the dam by 0.9 feet for 3.0 hours and attain a critical velocity of 4.4 feet per second. Overtopping velocities are not considered detrimental to the structure. The spillway is adjudged as inadequate, but not seriously inadequate.

The visual inspection revealed no problems in need of immediate attention. Maintenance is performed by the owner. However, there is no regular maintenance operations program or warning system. It is recommended that a regular maintenance and operations program be instituted with provisions for records of all maintenance performed. It is also recommended that warning system be established and that the maintenance items listed in Section 7.2 be accomplished as part of the regular maintenance program within the next 12 months.

Submitted By:

Original signed by:
Carl S. Anderson, Jr.

CARL S. ANDERSON, JR.
Acting Chief, Design Branch

Approved:

Original signed by:
Douglas L. Haller

DOUGLAS L. HALLER
Colonel Corps of Engineers
Commander and District Engineer

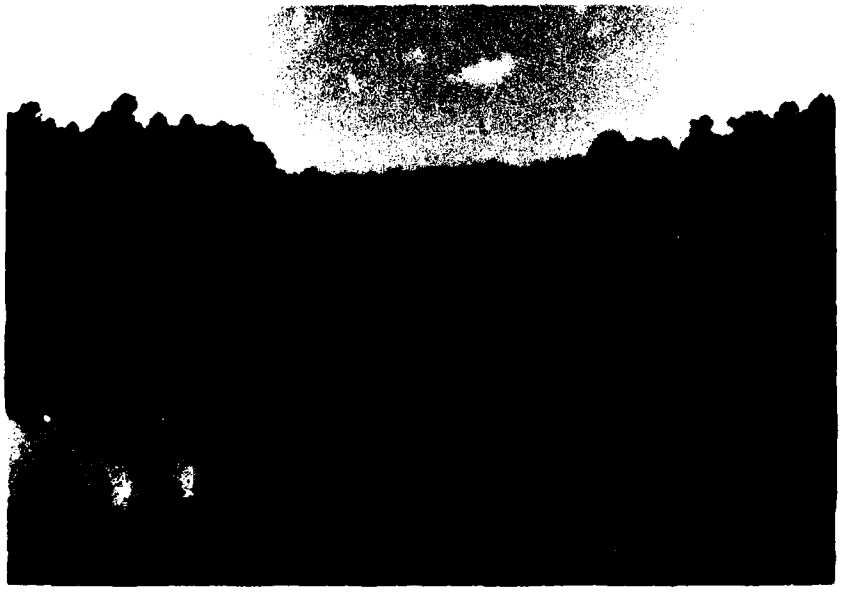
Date: AUG 19 1981

Recommended By

Original signed by
JACK G. STARR

JACK G. STARR
Chief, Engineering Division

DAM



RESERVOIR

OVERALL VIEWS - CAGE DAM

1 MAY 1981

SECTION 1

PROJECT INFORMATION

1.1 General:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers to initiate a National Program of Safety Inspections of Dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (Reference 1, Appendix IV). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description:

1.2.1 Dam and Appurtenances: Cage Dam is an earthfill embankment about 400*feet long and 26.3**feet high. The crest of the dam is 13 feet wide and is nearly uniformly horizontal at elevation 391.3 msl. The upstream average slope is approximately 2.9 horizontal to 1 vertical (2.9H:1V) above the waterline. The downstream average slope is 2.8H:1V. The embankment has no slope protection on the upstream face. The dam was constructed with a clay core and a key trench, however, it is unknown if there is a foundation drainage system.

The principal spillway is estimated to be an ungated 42-inch corrugated metal pipe (CMP) riser located about 15 feet into the reservoir with a crest elevation of 100.0 TBM*** or 385.0 msl. The intake pipe was obscured by a sheet metal enclosure and could not be observed. The vertical CMP riser connects to a 30-inch CMP which passes through the dam at a low level and discharges at the toe of the dam. There is a 6-foot by 6-foot by 1 foot sheet metal enclosure over the principal spillway intake. The structure serves as a trash guard.

* Dam length is measured from natural ground at the left abutment to natural ground at the right abutment. The width of the emergency spillway is not considered part of the dam length.

** Dam height based on the difference in elevation between the streambed at the toe of the dam and the maximum height of the crest.

*** TBM (Temporary Bench Mark) - Taken as 100 feet elevation for the reservoir water surface during the inspection. Later the TBM was correlated with the U.S. Geological Survey Map, South Boston, Va., to be 385 feet elevation for the reservoir water surface.

The emergency spillway is an open channel cut at the right abutment. The emergency spillway control section is 25 feet wide with a minimum crest elevation of 388.2 msl.

1.2.2 Location: Cage Dam is located just east of the South Boston city limits on Rocky Branch of Route 304.

1.2.3 Size Classification: The dam is classified as a small size structure on the basis of its height as defined in Reference 1 of Appendix IV.

1.2.4 Hazard Classification: There is an occupied home and State Route 304 immediately downstream from the dam, such that its failure could endanger lives and cause economic losses. Therefore, a significant hazard classification is given according to guidelines contained in Section 2.1.2 of Reference 1, Appendix IV. The hazard has nothing to do with its stability or probability of failure.

1.2.5 Ownership: Cage Dam is owned by Mr. Robert F. Cage.

1.2.6 Purpose: The dam is used for recreation by the owner.

1.2.7 Design and Construction History: Construction of the dam was completed in 1959.

1.2.8 Normal Operational Procedures: Water passes automatically through the principal spillway and emergency spillway as the reservoir rises above the principal spillway intake riser, and the emergency spillway crest.

1.3 Pertinent Data:

1.3.1 Drainage Area: The dam controls a drainage area of .53 square miles.

1.3.2 Discharge at Dam Site: Maximum Flood - The emergency spillway was used once 15 years ago.

Pool level at lowest point on dam crest (elevation 106.3 TBM or 391.3 msl)

Principal spillway.....110 cfs

Emergency Spillway.....410 cfs

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet msl	Reservoir Capacity			Length, (feet)
		Area (Acres)	Acre feet	Watershed, Inches	
Top of Dam	391.3	13.5	138	4.9	1800
Emergency Spillway Crest	388.2	10.0	100	3.6	1550
Principal Spillway Crest	385.0	7.3	73	2.6	1200
Streambed at Downstream toe of dam	365.0	-	-	-	-

SECTION 2

ENGINEERING DATA

2.1 Design: There is no known design information, other than the fact that design assistance was provided by the Soil Conservation Service.

2.2 Construction: There are no known construction records, other than the dam was built in 1959 with a clay core, key trench, and on-site inspections by SCS.

2.2 Evaluation: There is insufficient information to evaluate the foundation condition and the embankment stability.

SECTION 3

VISUAL INSPECTION

3.1 Findings:

3.1.1. General: The results of the inspection was conducted on 1 May 1981 are recorded in Appendix III. At the time of the inspection, the weather was sunny and clear, with a temperature of 65°F. The ground condition dry. The reservoir elevation was at 365 feet msl (100 TBM). The principal spillway consists of a corrugated metal pipe (CMP) through the embankment at a low level with a vertical riser serving as the intake with a metal enclosure as a trash guard. The emergency spillway is an earthen channel located in the right abutment. Flow was passing through only the principal spillway at the time of the inspection. The tailwater elevation was at 366.5 feet msl (81.4 TBM). There are no known prior inspection reports.

3.1.2 Embankment: A sketch of the embankment showing a cross section and crest profile is provided in Appendix I. A plan view is also given in Appendix I. Overall views of the dam are provided at the beginning of the report.

The embankment crest and upstream face are in good condition with no signs of surface cracks, unusual movement, or misalignment. A good grass cover exists on the crest and the upstreeam face, with the exception of an area near the water level that was recently burned off and small trees cut. No riprap was observed on the upstream face of the dam at water level. The upstream face has a few cedar trees and a popular tree growing near the water's edge. The downstream face is covered with dense underbrush and pine and cedar trees with diameters of up to 6 inches. No seepage was observed; however, the dense growth of vegetation on the downstream face and piles of brush at the toe prevented detailed observation and assessment of surface conditions. No foundation drain outlets were observed.

3.1.3 Principal Spillway: The principal spillway is a 30-inch diameter corrugated metal pipe (CMP) passing through the embankment at a low level and discharging into the stilling basin at the toe of the dam. The 30-inch CMP is connected to a vertical riser intake estimated to be a 42-inch CMP. The riser was obscured by a sheet metal enclosure approximately 6 ft. x 6 ft. x 1 ft. in size. The enclosure serves as a trash guard and prevents observation of the spillway intake.

The stem of an emergency valve of unknown size was observed. The emergency gate was operated fifteen years ago to dewater the reservoir. However, the wheel controlling the valve has been lost.

3.1.4 Emergency Spillway. The emergency spillway is an earthen open channel in the right abutment with a control section 25 feet wide. The control section of the emergency spillway is heavily overgrown with pines and cedars and dense underbrush. The approach channel for the emergency spillway is covered with pines and cedars and a grassy area serving as a roadway crossing the channel. The approach channel at water's edge has pines growing with a maximum diameter of 6 inches. The discharge channel of the emergency spillway also has pines and cedars growing with maximum diameters of 8 inches. There are areas of dense underbrush in this area as well.

3.1.5 Instrumentation. There is no instrumentation on this dam.

3.1.6 Reservoir Area. The slopes of the watershed are mild and covered with woods. The periphery of the reservoir is cleared of underbrush for approximately 25 feet and the clear area has a good grass cover beneath randomly growing trees. There are no signs of reservoir slope failure.

The reservoir was drained 15 years ago and the sediment was used to build an island in the upper reaches of the reservoir. Two sedimentation ponds are located in the drainage area controlled by the dam. For this reason, this was not considered a problem and was not evaluated.

3.1.7 Downstream Channel. The channel immediately below the dam is a natural stream in a wooded valley with bedrock outcropping in the streambed. Approximately 600 feet below the dam is one occupied structure and State Route 304.

3.1.8 Stilling Basin. The stilling basin is a rock bottom approximately 20 feet by 10 feet with steep exposed earth walls averaging 3 feet in height. There was no riprap placed to protect the sides. Trees and underbrush are growing moderately thick in the overbanks.

3.2 Evaluation. Overall, the dam appears to be in good condition. The inspection revealed certain preventative maintenance items which should be scheduled as part of an annual maintenance program. These are:

a. Remove underbrush from dam, emergency spillway, and stilling basin. Cut all trees less than 3 inches in diameter at the ground. All trees greater than 3 inches in diameter growing in the embankment should have their root ball removed and have compacted fill placed in the holes and the fill seeded. Seed bare areass exposed by the clearing operations to maintain a good grass cover over entire embankment. Mow the entire embankment and emergency spillway routinely.

b. Install staff gauge, which is a staff, rod, or post with elevations indicated on it permanently mounted to show the depth of water. It should be of sufficient height to indicate depth of flow through the emergency spillway.

c. Obtain another drawdown valve control wheel and store it in a secure location with easy access in the event it becomes necessary to dewater the reservoir.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures: The normal storage pool is about elevation 385.0 feet msl which is the elevation of the crest of the riser intake for the principal spillway. Water passes automatically over the crest of the intake riser as the water level in the reservoir rises. Ultimately water will pass through the emergency spillway when the lake level rises above the elevation of its crest. The reservoir may be dewatered by an emergency valve of unknown size.

4.2 Maintenance: General maintenance work is performed at the dam as the need arises. The crest and upstream face are mowed routinely.

4.3 Warning System: At present time, there is no warning system or evacuation plan for Cage Dam.

4.4 Evaluation: The dam does not require an elaborate operation and maintenance program. However, a program should be initiated which includes but is not limited to monitoring of the embankment as well as seasonal activities such as mowing and clearing. An emergency operation and warning plan should be developed, to include:

a. How to operate the dam during an emergency.

b. Who to notify, including public officials, in case evacuation from the downstream area becomes necessary.

The local Emergency Services Coordinator of the State Office of Energy and Emergency Services can assist in the preparation of an Emergency Warning Plan.

SECTION 5

HYDRAULIC/HYDROLOGIC DATA

5.1 Design: None were available.

5.2 Hydrologic Record: None were available.

5.3 Flood Experience: The owner indicated that the emergency spillway was used about 15 years ago.

5.4 Flood Potential: The 100-year flood, 1/2 PMF, and PMF were developed using the HEC-1 computer program (Reference 2, Appendix IV) and routed through the reservoir using the NWS-Dambreak computer program (Reference 7, Appendix IV) and appropriate precipitation and storage-outflow data. Clark's Tc and R coefficient for the local drainage area was estimated from basin characteristics. The rainfall, applied to the developed unit hydrographs, was obtained from the National Weather Bureau Publications (Reference 3 and 4 of Appendix IV).

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1.

Water passes automatically through the principal and emergency spillways as the reservoir rises above spillway's crests.

The storage curve was developed based on areas obtained from a U.S. Geological Survey Quadrangle Map. Survey data taken during the inspection was correlated to the South Boston, Virginia Quadrangle Map to help develop area-storage data. Rating curves for the emergency spillway and non-overflow section were developed internally by the Dambreak computer model. A rating curve for the principal spillway was developed externally and input to the Dambreak computer model. In routing hydrographs through the reservoir, it was assumed that the initial pool level was at the principal spillway crest (elevation 385.0).

5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on reservoir performance is shown in the following table:

Table 5.1 RESERVOIR PERFORMANCE

Item	Normal Flow	100 1/ Year	1/2 PMF	PMF 2/
Peak flow c.f.s.				
Inflow	.5	783	1836	3623
Outflow	.5	437	1786	3575
Maximum elevation ft. msl	385.0	390.9	392.2	393.0
Non-overflow section (elevation 391.3)				
Depth of flow, ft.	-	-	.9	1.7
Duration, hrs.	-	-	3.0	5.2
Velocity, fps 3/	-	-	4.4	6.0
Tailwater elevation ft. msl	366.4	-	-	-

1/ The 100-Year Flood has one chance in 100 of occurring in any given year.

2/ The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

3/ Critical Velocity

5.7 Reservoir Emptying Potential: The exact size of the drawdown outlet is unknown so it was assumed to be eight inches in diameter which is normal for this size structure. Its outlet elevation is assumed to be 368.8 and will pass 7 c.f.s. with the reservoir level at the crest of the principal spillway and essentially dewater the reservoir in 13 days. This is equivalent to an approximate drawdown rate of 1.5 feet per day. This is based on the hydraulic height measures from maximum storage pool divided by the time to dewater the reservoir.

5.8 Evaluation: Based on the size (small) and hazard classification (significant), the recommended Spillway Design Flood (SDF) is the 100-Year Flood to the 1/2 PMF. Because of the risk involved, the 1/2 PMF has been selected as the SDF. The spillway will pass 12 percent of the PMF or 24 percent of the SDF without overtopping the dam. The SDF will overtop the dam by a maximum of 0.9 feet, reach an average critical velocity of 4.4 per second and flow over the dam for 3 hours.

Conclusions pertain to present day conditions. The effect of future development on the hydrology has not been considered.

SECTION 6

DAM STABILITY

6.1 Foundation and Abutments: There is no information available on the foundation conditions, except what can be inferred from geologic studies of the area, which lies within the Piedmont geologic province. Briefly, the area is underlain by granite and hornblende gneiss, referred to as "mixed gneisses" in the text of Bulletin 75: Geology and Ground-Water Resources of Pittsylvania and Halifax Counties, published by the Virginia Division of Mineral Resources. The geologic map in this publication indicates that the dam site itself is underlain by granite gneiss, which can be observed in rock outcrops in the streambed below the dam. Residual soils derived from this material can be highly variable, but typically are yellow or brownish-yellow light friable sandy clays or brownish-yellow or brown heavy plastic clays. These soils may exhibit a considerable potential for shrinking and swelling with changes in moisture content. The weathered parent rock may be found at depth of only a few feet below the surface in places. Soil samples examined during the inspection appear to be yellow or brownish-yellow sandy clay or clay.

The site should afford a good foundation for the dam, assuming that proper care was taken during construction to guard against the problems inherent in areas of expansive soils. The clayey nature of the area soils would make the foundation relatively impermeable. There is no evidence of undue settlement of the dam which would have resulted from a clay foundation being compressed under the weights of the embankment. It is likely that the embankment may rest to a large degree on the weathered rock noted at relatively shallow depths on the site. The owner indicated that the dam was keyed into the foundation. There is no evidence that the dam has a foundation drainage system, and does not appear to be a problem.

6.2 Embankment:

6.2.1 Materials: There is no information recorded on the nature of the embankment materials, but it is likely that the source of borrow for the dam was located in the vicinity of the impoundment, with a considerable portion probably coming from within the area presently covered by the reservoir. As noted, the area soils appear to be clays and sandy clays of medium to high plasticity.

6.2.2 Stability: There are no available stability calculations. The dam is 26.3 feet high and 13 feet wide at the crest. A upstream slope is 2.9H:1V and the downstream average slope is 2.8H:1V. The existing pool is approximately 2.9 feet below maximum control storage pool, which is at the crest of the emergency spillway. The reservoir experienced once, fifteen years ago, a pool level in excess of the maximum control storage pool. The dam is subject to a drawdown rate of 1.5 feet per day which is in excess of the recommended rate of .5 per day.

According to the guideline presented in Design of Small Dam, U.S. Department of the Interior, Bureau of Reclamation, the slopes recommended for a homogeneous small dam of similar material subjected to a rapid drawdown are 3.5H:1V upstream and 2.5H:1V downstream. The recommended crest width is 15 feet. Based on these guidelines, the Cage Dam has an inadequate upstream slope and an adequate downstream slope. The crest of the Cage Dam is inadequate also.

6.2.3 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: There is insufficient information to adequately evaluate the stability of the dam. Based on the visual inspection, the foundation and embankment are in good condition. Based on the Bureau of Reclamation guidelines, the downstream slope is adequate and the crest and upstream slope are inadequate.

However, the embankment is considered stable during both normal pool and maximum storage pool operations. In addition, overtopping is not a problem because the flow for the spillway design flood is of less than one foot in depth, is of relatively brief duration, and the velocity is less than 6 fps, the effective eroding velocity for a vegetated earth embankment. Also, the visual inspection revealed no apparent instability. Therefore, a stability check is not required.

SECTION 7

ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: There is no engineering data available to sufficiently evaluate the embankment stability. However, the visual inspection revealed no findings to prove the dam unsound. A stability check of the dam is not required.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is the 1/2 PMF. The spillways will pass 12 percent of the PMF or 24 percent of the SDF without overtopping the crest of the dam. The SDF will overtop the dam by 0.9 feet for 3.0 hours and attain a critical velocity of 4.4 feet per second. Flows overtopping the crest of the dam during the SDF are not considered detrimental to the dam. The combined capacity of the spillways is considered inadequate, but not serously inadequate. Overall the dam is in good condition and there is no immediate need for remedial measures.

7.2 Recommended Remedial Measures: It is recommended that the regular maintenance operation program be formalized for future reference. A formal emergency procedure should be prepared and furnished to those responsible for maintaining the dam in a safe condition. This should include how to operate the dam during an emergency, and who to notify, including public officials, in case evacuation from the downstream area is necessary. The local Emergency Services Coordinator of the State Office of Energy and State Office of Energy and Emergency Services can assist in the preparation of an Emergency Warning Plan. Also, the inspection revealed the following maintenance items that should be scheduled by the owner during a regular maintnenace period within the next 12 months:

a. All trees and saplings and underbrush on the dam, in the emergency spillway, and around the stilling basin should be cut even with the ground to prevent the eventual deterioration of the dam by root systems. All trees growing on the dam with diameters greater than three inches should have the root ball and root structure removed. The subsequent holes should be filled with well compacted soil and then seeded. Bare areas exposed by removed underbrush should also be seeded to ensure adequate grass cover overall.

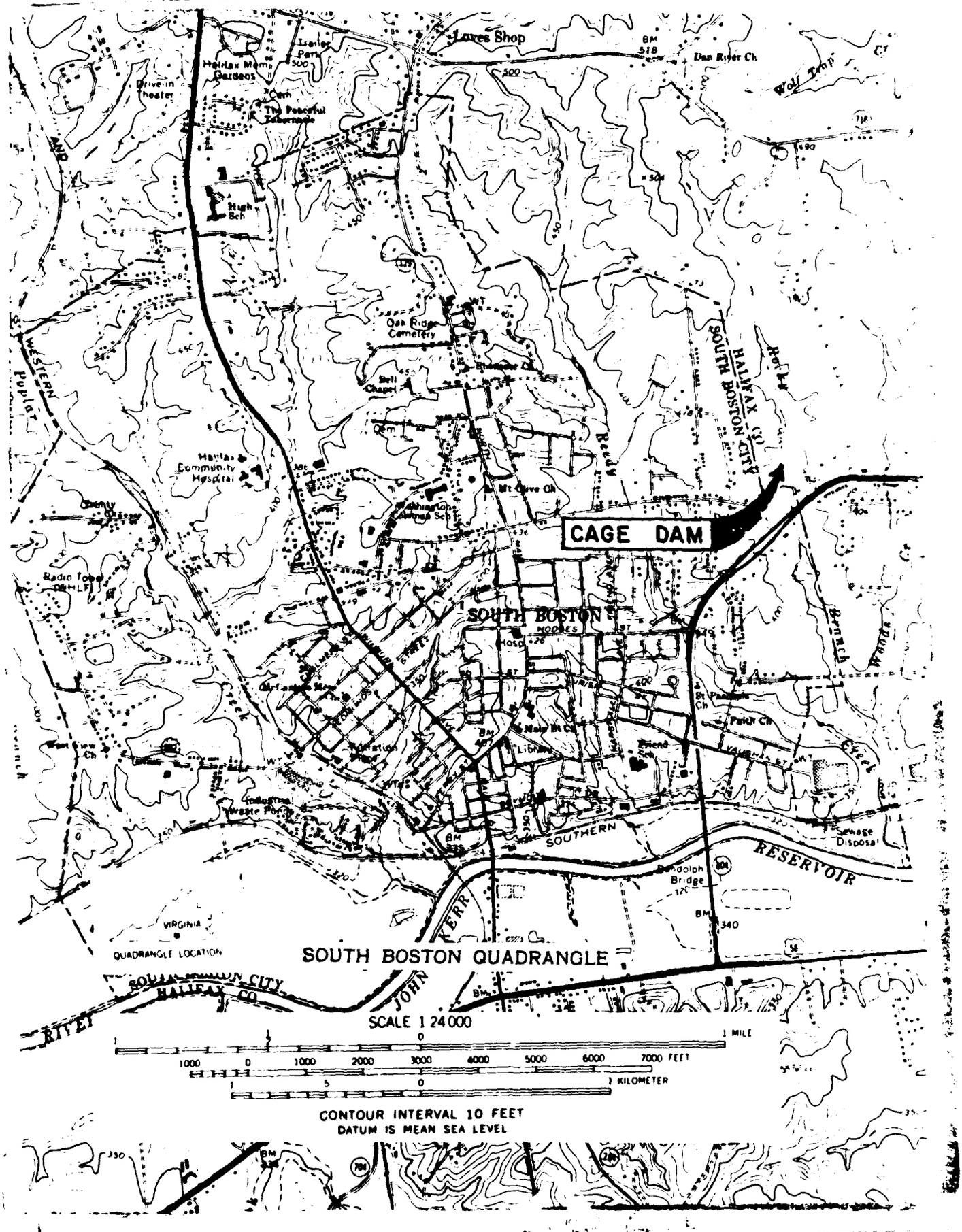
b. Continue mowing the dam and emergency areas to maintain the grass cover and prevent the encroachment of underbrush.

c. Install staff gauge, which is a staff, rod, or post with elevations indicated on it permanently mounted to show the depth of water. It should be of sufficient height to indicate depth of flow through the emergency spillway.

d. Obtain another drawdown valve control wheel and store it in a secure location with easy access in the event it becomes necessary to dewater the reservoir.

APPENDIX I

MAPS AND DRAWINGS


CAGE DAM
SOUTH BOSTON
SOUTH BOSTON QUADRANGLE
QUADRANGLE LOCATION
VIRGINIA
SCALE 1 24 000
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7000 FEET
1 KILOMETER
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL
Loves Shop
Dan River Ch
Wolf Trap Cr
Oak Ridge Cemetery
Mt Olive Ch
Washington Colonial Sch
Hosp
Main St Ch
Library
Post Office
Industrial Waste Pond
Sewage Disposal
Randolph Bridge
SOUTHERN
RESERVOIR
Dry Fork
Reedy Creek
Poplar Creek
Western Branch
Wooden Branch
South Boston City
Halifax Co
Halifax Community Hospital
Radio Tower (WHLF)
Drive-in Theater
The Peaceful Tabernacle
Halifax Memorial Gardens
Trailer Park
Hugh Sch
Bell Chapel
Cem
Dairy
Antique Store
Nooses
Main St
Broad St
Virginia St
Wilborn St
Church St
Bridge St
Patrick St
Pearl St
Wynn St
Hall St
Mill St
Lee St
Jefferson St
Eanes St
Wilson St
Hamilton St
Edmunds St
Clay St
Carrington St
Halifax St
Hunter St
Wilborn Ave
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Friend Ch
Parish Ch
Valley Ch
Mt Olive Ch
Oak Ridge Ch
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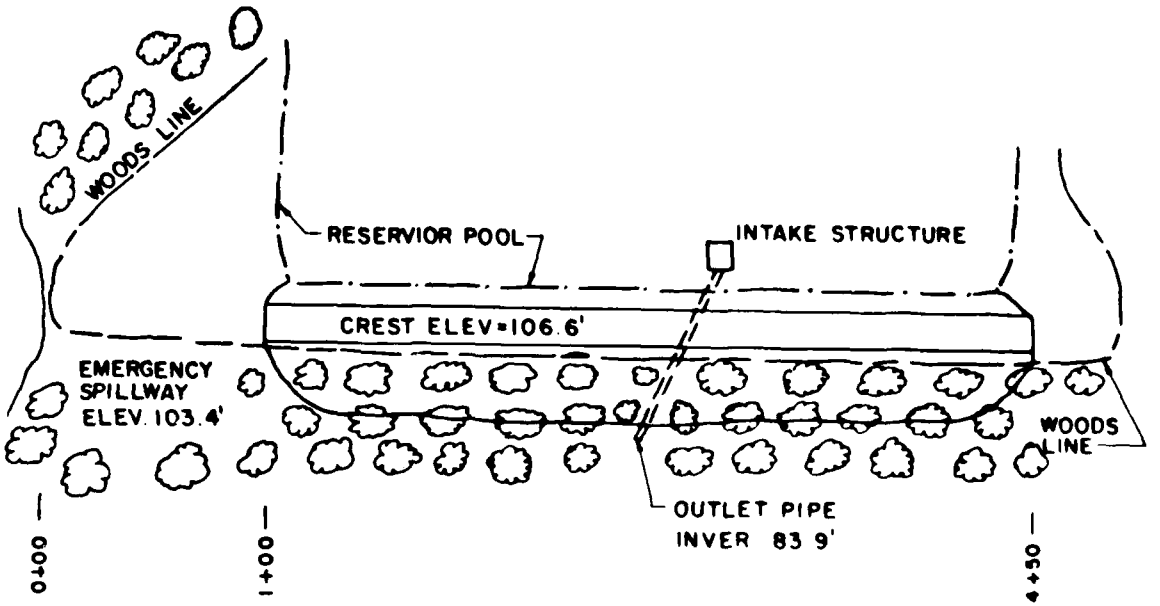


PLAN VIEW OF THE DAM

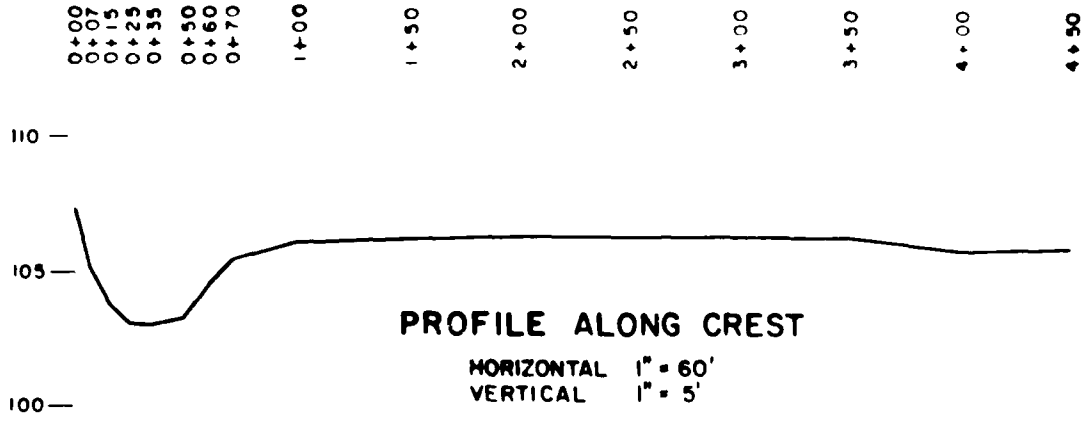
NOT TO SCALE

NOTES:

1. SKETCH MADE FROM FIELD NOTES
2. ELEVATIONS BASED ON TBM OF WATER SURFACE = 100.00'.

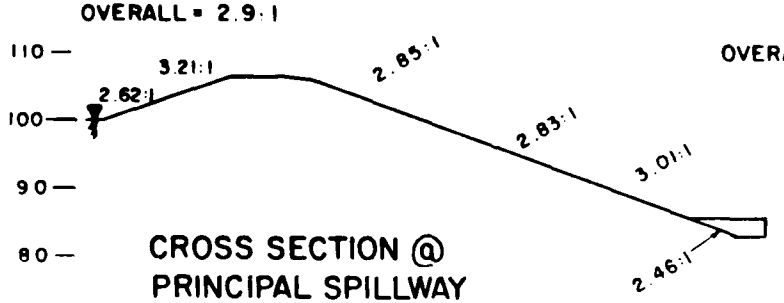
CAGE DAM
HALIFAX COUNTY

PLATE I



PROFILE ALONG CREST

HORIZONTAL 1" = 60'
VERTICAL 1" = 5'



CROSS SECTION @ PRINCIPAL SPILLWAY (3+00)

SCALE = 1" = 20'

OVERALL = 2.82:1

CAGE DAM
HALIFAX COUNTY

PLATE II

APPENDIX II

PHOTOGRAPHS

PHOTO #1 CREST & DOWNSTREAM FACE OF DAM

PHOTO #2 UPSTREAM FACE

PHOTO #3 PRINCIPAL SPILLWAY INTAKE STRUCTURE (COVERED) & RESERVOIR DRAIN OPERATOR

PHOTO #4 PRINCIPAL SPILLWAY OUTLET

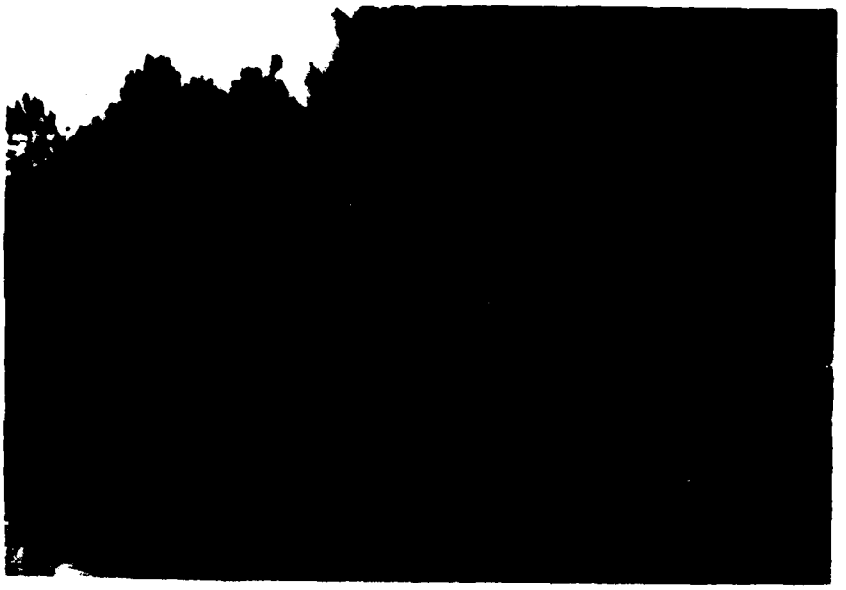


PHOTO #5 EMERGENCY SPILLWAY
APPROACH CHANNEL

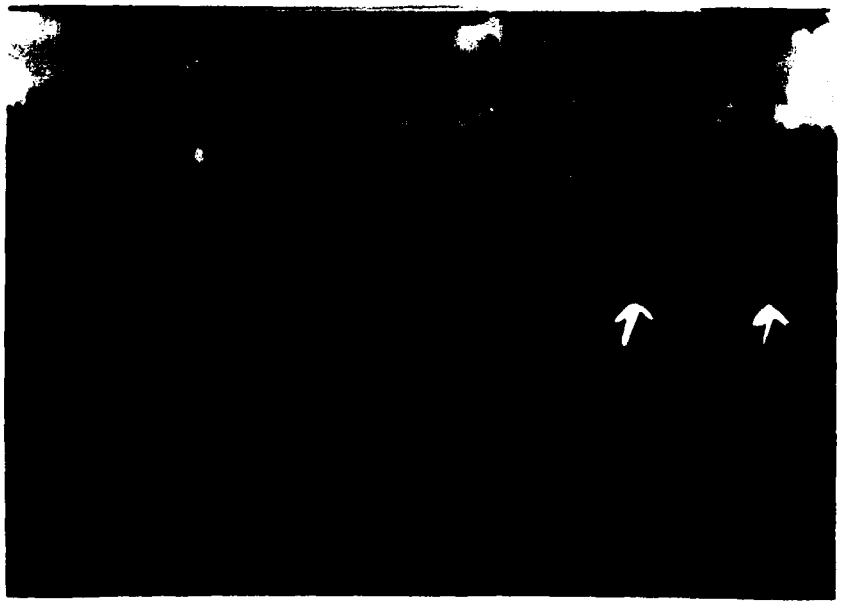


PHOTO #6 EMERGENCY SPILLWAY
(SAG IN DAM CREST LINE)

APPENDIX III

FIELD OBSERVATIONS

Check List
Visual Inspection
Phase 1

Name Dam: Cage Dam County: Halifax State: Virginia Coordinates: Lat. 36-42.8
Long. 78-53.0

Date(s) Inspection: 1 May 1981 Weather: Clear Temperature: 65°F

Pool Elevation at Time of Inspection: 100'TBM* Tailwater at Time of Inspection: 81.4'*TBM

Inspection Personnel:

Bo Taran	COE	Len Jones	COE	Hugh Gildea	SWCB
Jim Robinson	COE	Dave Bushman	SWCB		
Dan Davis	COE	Leon Musselwhite	SWCB	Robert F. Cage,	Owner

Dave Bushman Recorder

*TBM (Temporary Bench Mark)- Taken as 100 feet elevation for the reservoir water surface during the inspection. Later the TBM was correlated with the U.S. Geological suvey map, South Boston, VA., to be 385 feet msl for the reservoir water surface

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed Soil was average dry condition	Dense underbrush made this difficult to evaluate.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	Piles of brush obscured the downstream toe of the dam in places. Also dense ground cover and underbrush made it difficult to evaluate.
SLOUGHING OR EROSION EMBANKMENT AND ABUTMENT SLOPES	No sloughing was observed. A wave berm extends along the entire upstream water line.	Dense underbrush made this difficult to evaluate.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE	Appears to be good.	None
RIPRAP FAILURES	No riprap was observed on upstream face of the dam or in the stilling basin.	None

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
FOUNDATION	No apparent foundation instability,	None.
ANY NOTICEABLE SEEPAGE	None observed.	Dense underbrush made this very difficult to evaluate.
DRAINS	No outlets were observed.	None
MATERIALS	Unknown, local soils appear to be clays and sandy clays.	None
VEGETATION	Downstream face is covered by dense underbrush and pine and cedar trees with diameters up to 6 inches. The crest and upstream face have good grass cover with the exception of an area near the water level that was recently burned off and small trees cut down. The upstream face had a few cedar trees and a poplar tree growing near the water's edge.	All trees less than 3 inches diameter should be cut off with the ground. All trees with diameters greater than 3 inches should be cut down, their root ball removed, and compacted fill placed in the hole and seeded. The underbrush should be removed from the embankment and a good grass cover should be established.

PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
INTAKE	The intake was observed by a sheet metal trash guard. (6' x 6' x 1') It is probably a 42-inch CMP based on the size of the outlet which was a 30-inch CMP	None.
APPROACH CHANNEL		
OUTLET	This was a 30-inch CMP discharging into a large stilling basin approximately 10' x 20'. The banks on each side of the basin had some trees and underbrush but did not restrict flow appreciably.	None.
BRIDGE AND PIERS		
EMERGENCY GATE	The size is unknown. The wheel controlling the valve was lost. It was operated 15 years ago to dewater the reservoir.	Find a new wheel and store it in a secure location with easy access in the event that it becomes necessary to dewater the reservoir
GATES AND OPERATION EQUIPMENT		

EMERGENCY SPILLWAY

VISUAL EXAMINATION OF	OBSERVATION	REMARKS AND RECOMMENDATIONS
CONTROL SECTIONS	Heavily overgrown with pines and cedars and dense underbrush.	None
APPROACH CHANNEL	Covered with pines and cedars with a maximum diameter of 6 inches with the exception of a grass roadway crossing the approach channel.	Remove trees to reduce the chance of damning.
DISCHARGE CHANNEL	Not as overgrown with pines and cedars as the control section. Maximum tree size was 8 inches. There was some dense underbrush in areas.	Remove trees and underbrush and establish a good grass cover.
BRIDGE AND PIERS		
MISCELLANEOUS		

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
STAFFGAGES	None	Place staff gage in the vicinity of the reservoir so the the pool level can be monitored.
OTHER		

RESERVOIR

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gently sloped and largely wooded. No slope instability was observed.	None
SEDIMENTATION	The reservoir was drained 15 years ago and the sediment was used to build an island in the upper reaches of the reservoir. Two sedimentation ponds are located in the drainage area controlled by the dam and therefore sedimentation is probably not a problem.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel was fairly clear with bedrock outcropping in the streambed. The channel banks and flood plain were wooded.	None
SLOPES	The slopes of this stream were gentle.	None
APPROXIMATE NO. OF HOMES AND POPULATION	One occupied structure is located approximately 200 yards below the dam. Immediately below this is State Route 304 which is a four lane divided highway.	None

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATIONS

ITEM	REMARKS
REGIONAL VICINITY MAP	
DESIGN/CONSTRUCTION HISTORY	The dam was built in 1959 with SCS assistance from Carlton Loftis. The dam was constructed with a clay core, key trench, and onsight inspection by SCS.
PLAN OF DAM	
TYPICAL SECTION OF DAM	
OUTLETS - PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	
SPILLWAY - PLAN SECTION DETAILS	
OPERATING EQUIPMENT - PLAN DETAILS	

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATIONS

ITEM	REMARKS
MONITORING SYSTEMS	
RAINFALL/RESERVOIR	Emergency spillway was used once about 15 years ago.
GEOLOGY REPORTS	
BORROW SOURCES	
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY-FIELD TEST DATA	
HYDROLOGIC/HYDRAULIC DATA	The lake was drawn down about 15 years ago. Wheel lost to drawdown control stem.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATIONS

ITEM	REMARKS
DESIGN REPORTS	
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	
POST CONSTRUCTION ENEGINEERING STUDIES RECORDS, SURVEYS	
MODIFICATIONS	Built island in reservoir about 15 years ago when the lake was drained.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	
MAINTENANCE OPERATION RECORDS	Mows upstream face and crest routinely

APPENDIX IV

REFERENCES

REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Office of the Chief of Engineers, Departments of the Army, Washington, D. C.

2. HEC-1DB Flood Hydrograph Package, (Hydrologic Engineering Center, U. S. Army Corps of Engineers, September 1978.

3. "Probable Maximum Precipitation Estimates, United States East of the 105th Meridian," Hydrometeorological Report No. 51, (U. S. Weather Bureau, June 1978).

4. "Rainfall Frequency Atlas of the United States", Technical Paper No. 40, (U. S. Weather Bureau, May 1961).

5. "Design of Small Dams", Technical Publication of United States Department of the Interior, Bureau of Reclamation, Second Edition, Revised Reprint, 1977.

6. Soil Survey of Halifax County, Virginia, (U.S. Department of Agriculture, 1938).

7. NWS-Dambreak Computer Model, (Office of Hydrology, National Weather Service (NWSO, Silver Springs, Maryland, September 1980.

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